WE CLAIM:

1. A retinal implant for electrically inducing formed vision in the eye, comprising a PiN microphotodiode where the P side of the implant has a light filter layer that selectively permits a selected bandwidth of the ultraviolet, visible, and infrared spectrum to pass, and where the N-side of the implant has a light filter layer that selectively permits the a selected bandwidth of the ultraviolet, visible, and infrared spectrum to pass, whereby the retinal implant can stimulate the retina regardless of whether the P-side or the N-side is oriented toward light incident to the eye.

2. The retinal implant of claim 1 wherein the N-side and the P-side filter layers selectively permit substantially the same bandwidth to pass.

3. The implant of claim 2 wherein the N-side light filter layer is a dielectric filter that allows 740 nm to 900 nm to pass

4. The implant of claim 3 wherein the P-side light filter layer is a dielectric filter that allows 740 nm to 900 nm to pass

5 The implant of claim 2 wherein the N-side light filter layer is a dielectric filter that allows 400 nm to 740 nm to pass.

6. The implant of claim 5 wherein the P-side light filter layer is a dielectric filter that allows 400 nm to 740 nm to pass.

7. The retinal implant of claim 1 wherein the N-side and the P-side filter layers selectively permit substantially different bandwidth to pass.

8. The implant of claim 7 wherein the N-side light filter layer is a dielectric filter that allows 740 nm to 900 nm to pass.

9. The implant of claim 8 wherein the P-side light filter layer is a dielectric filter that allows 400 nm to 740 nm to pass.

10. The implant of claim 7 wherein the N-side light filter layer is a

dielectric filter that allows 400 nm to 740 nm to pass.

11. The implant of claim 10 wherein the P-side light filter layer is a dielectric filter that allows 740 nm to 900 nm to pass.

12. The retinal implant of claim 1 wherein the PiN microphotodiode contains (1) a P-electrode made of P-doped polysilicon, (2) a P-side light filter dielectric layer, (3) a P+ layer, (4) an intrinsic layer, (5) a N-type silicon substrate, (6) a N+ layer, (7) a N-side light filter dielectric layer, and (8) a N electrode made of a N-doped polysilicon.

13. The retina implant of claim 12 wherein the implant further includes a first electrical contact pad that establishes electrical contact between the P-electrode and the P+ layer, and a second electrical contact pad that establishes electrical contact between the N-electrode and the N+ layer.

14. The implant of claim 1 wherein the implant includes two of said PiN microphotodiodes, each of the microphotodiodes having an opposite orientation from the other such that when implanted in the eye, the P-side of one microphotodiode will face incident light, and the N-side of the other microphotodiode will face incident light.

15. The retinal implant of claim 12 wherein, the P-electrode projects outwardly from the surface of the implant.

16. The retinal implant of claim 12 wherein, the N-electrode projects outwardly from the surface of the implant.

17. The retinal implant of claim 15 wherein, the N-electrode projects outwardly from the surface of the implant.

18. The retinal implant of claim 17 wherein, each of the P-electrode and N-electrode projects from about 1 micron to about 200 microns.

19. The retinal implant of claim 18 wherein, each of the P-electrode and N-electrode projects from about 2 micron to about 100 microns.

20. The retinal implant of claim 14 wherein a common electrode is in

electrical contact with both the P-surface and the N-surface on one side of the implant and another common electrode is in electrical contact with both the P-surface and the N-surface on the other side of the implant.

21. The retinal implant of claim 20 wherein a plurality of the said implants are fabricated upon a common silicon substrate wafer.

22. The retinal implant of claim 21 wherein the common silicon substrate wafer has a beveled edge.

23. A method of restoring formed vision to a patient having retinal damage, comprising implanting plural implants into the patient's eye adjacent the retina, each implant comprising a PiN microphotodiode where the P side of the implant has a light filter layer that selectively permits a selected bandwidth of the ultraviolet, visible, and infrared spectrum to pass, and where the N-side of the implant has a light filter layer that selectively permits the a selected bandwidth of the ultraviolet, visible, and infrared spectrum to pass, whereby the retinal implant can stimulate the retina regardless of whether the P-side or the N-side is oriented toward light incident to the eye.

24. The method of claim 23 where the P side of each implant has a light filter layer that selectively permits only visible light to pass, and where the N-side of each implant has a light filter layer that selectively permits only infrared light to pass.

25. The method of claim 23 wherein a population of such implants are implanted in the "subretinal space" between the outer and inner retina in the eye such that, randomly, about half of them (i.e. the first subpopulation) will be oriented so that the P sides face light incident to the eye, and about half (i.e. the second subpopulation) will be oriented so that their N sides face incident light to the eye.

26. The method of claim 24 wherein a population of such implants are implanted in the "subretinal space" between the outer and inner retina in the eye such that, randomly, about half of them (i.e. the first subpopulation) will be oriented so that the P sides face light incident to the eye, and about

half (i.e. the second subpopulation) will be oriented so that their N sides face incident light to the eye.

27. The method of claim 26 wherein the first subpopulation of microscopic implants convert energy from incoming visible light into small electrical currents to stimulate the sensation of light detail in the eye to produce formed vision, and the second subpopulation converts infrared light induced electrical current to stimulate the retina with dark current to produce dark details.

28. The method of claim 27 wherein infrared light is introduced into the eye by an externally-worn unit containing an IR-capable image-producing device, whereby in darkness IR illumination is the predominate power source and powers the second subpopulation, stimulating the visual sensation of dark details.

29. The method of claim 28 wherein said IR-capable image producing device is also visible-light capable wherein under conditions displaying light and dark details, a current will be induced in the first subpopulation by ambient visible light, and a current is induced in the second subpopulation by IR light, producing a combined perception of light and dark details.

30. The method of claim 29 wherein said externally-worn unit further includes an imaging CCD camera to capture real-time images, and further includes computer means to digitize those images and transmit those images to said image-producing device.

31. The method of claim 30 wherein said real-time images produced by the image-producing device are presented to the retina superimposed on the visible and infrared real, ambient images.

32. The method of claim 31 wherein the images produced by image producing device are presented either simultaneously or in rapid succession with real, ambient images.

33. The method of claim 32 wherein the patient is provided with a

patient input device interfaced with the computer means to allow the patient to modify the IR and visible-light images produced by said externally-worn unit.

34. An implant for creating formed vision in the eye, comprising at least two microphotodiode subunits, each of the two subunits having opposite PiN and NiP orientations whereby when the implant is placed in the eye so as to receive incident light, one of the subunits has a PiN configuration relative to incident light and the other subunit has a NiP configuration relative to incident light.

35. The implant as recited in claim 34 wherein the two subunits are symmetrical and have positive pole electrodes on opposite surfaces of the implant and negative pole electrodes on opposite surfaces of the implant, whereby the implant can function in the same manner regardless of which of the two surfaces faces light incident to the eye.

36. The implant as recited in claim 35 comprising plural pairs of said two subunits.

37. The implant as recited in claim 36 wherein the implant comprises two pairs of said two subunits.

38. The implant as recited in claim 34 wherein the implant is between 1 micron and 1000 microns wide and long, and wherein the thickness of the implant is between about 1 to 500 percent of its width.

39. The implant as recited in claim 34 wherein the implant is between about 10 microns and about 50 microns wide and long, and wherein the thickness of the implant is between about 25 to 50 percent of its width.

40. A method of restoring formed vision to a patient having retinal damage, comprising implanting plural implants into the patient's eye adjacent the retina, each implant comprising at least two microphotodiode subunits, each of the two subunits having opposite PiN and NiP orientations whereby when the implant is placed in the eye so as to receive incident light, one of the subunits has a PiN configuration relative to incident light

and the other subunit has a NiP configuration relative to incident light.

41. The method of claim 40 wherein the two subunits of each implant are symmetrical and have positive pole electrodes on opposite surfaces of the implant and negative pole electrodes on opposite surfaces of the implant, whereby the implant can function in the same manner regardless of which of the two surfaces faces light incident to the eye.

42. The method of claim 41 wherein each implant comprises plural pairs of said two subunits.

43. The method of claim 42 wherein each implant comprises two pairs of said two subunits.

44. The method of claim 40 wherein each implant is between 1 micron and 1000 microns wide and long, and wherein the thickness of the implant is between about 1 to 500 percent of its width.

45. The method of claim 44 wherein the implant is between 10 and 50 microns wide and long, and wherein the thickness of the implant is between about 25 and 50 percent of its width.

46. The method of claim 44, wherein a plurality of said implants are embedded into a biologically compatible sheet, and wherein the sheet with the embedded devices is placed in the subretinal space.

47. The method of claim 46 wherein the sheet with the embedded devices is placed on the nerve fiber layer surface from the vitreous side.

48. The method of claim 47 wherein the sheet may be fabricated from a biologically degradable material.

49. The method of claim 40 wherein said implants are implanted on the nerve fiber layer surface.

50. A method of restoring formed vision to a patient having retinal damage, comprising implanting plural implants into the patient's eye on the

nerve fiber layer, each implant comprising a PiN microphotodiode where the P and the N electrodes each contain a projection such that the at least some of the P and the N electrodes of the plural implants penetrate into each of the sublamina "A" and "B" layers of the inner plexiform layer.

51. A retinal implant comprising two groups of microphotoelectric subunits formed on a substrate, the two groups being of opposite orientation: a first group of at least one PiN subunits, and a second group of at least one NiP subunits, such that the P+ layer of the first group is adjacent the N+ layer of the second group.

52. The retinal implant of claim 51 further comprising a first common electrode contacting the P-surface of at least one of the subunits of the first group to the N-surface of a second group subunit, and a second common electrode contacting the N-surface of at least one of subunits in the first group to the P-surface of a second group subunit.

53. The retinal implant of claim 52 wherein each PiN subunit is paired with an NiP subunit, and each paired PiN/NiP subunit combination has a first and second common electrode.

54. The retinal implant of claim 53 comprising plural paired PiN/NiP subunit combinations.

55. The retinal implant of claim 54 wherein the plural paired PiN/NiP subunit combinations are on a substrate from 1 micron to .25 mm in width.

56. The retinal implant of claim 54 wherein the plural paired PiN/NiP subunit combinations are on a substrate from .25mm to 15mm in width.